endangered, 33 under the category of endangered, and 16 are under vulnerable status. These conclusions certainly warrant immediately undertaking stringent measures to protect natural balsam growing habitats. It is also essential to undertake species rehabilitation programs to prevent extinction of endangered species. Another important contribution in this work, apart from the other original material, is the simple low cost technique of 'drip and splash method' which the author has developed to cultivate wild balsams in the greenhouse. This will definitely help to grow practically all balsams with ease for either research or ex-situ conservation.

This work deviates in the presentation of text and illustrations when compared to conventional taxonomic monographs; perhaps the author intentionally structured his work this way in order to break the monotony and make it user friendly. It would have been better if the author had followed the latest and standard nomenclatural norms and carried out better editing of the text before sending the manuscript to press, since lapses are found sporadically in the book. However, there is ample scope to improve the running text as well as to reduce the size of the book by printing plates back to back in the next edition.

Nevertheless, the author has done a commendable job and has produced an excellent piece of work on *Impatiens* of Western Ghats. I am strongly of the opinion that this type of monograph is needed for all the genera. Indeed, the author has set a model for future taxonomists who would like to take up monographic work on various groups of plants. I am sure it will greatly assist in correct identification as well as emphasizing the importance of using various other micro-morphological characters as supplementary traits in future monographic works. Though the book is priced on a no loss no profit basis, still the price is prohibitive and many individuals could not afford to own this book. However, it will be a good reference book in institutions engaged particularly in taxonomic research. On the whole, no monetary value can compensate for the amount of work and passion that has gone into this valuable monograph.

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ROBERT P. ADAMS. 2011. **Junipers of the World: The Genus *Juniperus*, Third Edition.** (ISBN: 978-1-4269-5382-8 (sc) pbk., Print-On-Demand). Trafford Publishing Co., 1663 Liberty Drive, Bloomington, Indiana, 47403, U.S.A. (**Orders:** www.trafford.com, www.juniperus.org, 1-888-232-4444). $29.95, 426 pp., b/w photos, illustrations, 8" × 11".

Robert Adams has devoted his entire academic career to the study of the genus *Juniperus* from graduate school days at the University of Texas beginning in 1966 until more recently at Baylor University where he is Professor of Biology. It is rare indeed for an author to reap the benefits of a concentrated study on any subject throughout their professional academic career that results in a book that is a masterpiece.

More evidence for this comprehensive treatment can be found in the Literature Cited that includes 118 papers published by Adams as part of a total of 373 mostly related to the taxonomy, nomenclature and identification of 67 species, 37 varieties 7 formas of Junipers. Additional information on evolution, ecology, geographic distribution and variation, phylogenetics based on DNA data and analysis with phylograms, cultivation and commercial uses of wood and wood products, especially the essential oils, provide an in-depth record of the biology of Junipers. This comprehensive listing of books and journal papers that covers 13 pages (368–382) will serve the user as a rich source of information about Junipers.

The book contents are organized into 11 chapters: Introduction; Geographic Variation; Speciation in sections of the genus; Keys to Junipers; Species Description, Distribution Maps and Plant Photos; Hybridization; Ecology; Seed Dispersal in *Juniperus*; Sex Expression in *Juniperus*; Cultivated Junipers; Commercial Use of Leaf and Wood Oil of *Juniperus*. A glossary of defined terminology was not included that would have made the mor-

phological structures described in the species descriptions more easily understood and the key characters employed in the identification keys more user friendly, especially for an audience who may have a more broader interest in conifers. A general classification of conifers, including the Junipers, would help give the reader evolutionary context for the phylogenetic relationships at ranks above the generic level.

Line drawing illustrations, maps, and tables are clear and distinct. Landscape, habit, morphological, and general interest black and white photographs number more than 700 of various sizes usually two to four per page. Unfortunately many of these photographic images appear washed out and lack detail because of resolution problems either due to the poor quality of the paper print, scanning pixels per inch, or both. There is not a subject index with pagination that guides the reader to specific information throughout the text.

The introduction includes the description of the leaves, cones, and the division into three sections with the characters compared in Table 1.1. All of the *Juniperus* taxa except one are found in the Northern Hemisphere and maps show this distributional geographic pattern. Bayesian Trees based on nr DNA (ITS) and cp trnC-trnD sequences serve to separate taxa into sections and clades so taxonomic decisions are supported by sequence data.

Geographic variation in *J. communis* is documented for the only species found in both the eastern and western hemispheres. Geographic colonization, migration pathways, and distributional patterns are traced during the last ice age (5,000 to 10,000 BP years ago). Collections made throughout the world along with DNA analysis, morphology, and physiological data result in the recognition of seven varieties. *Juniperus ashei* occurs on millions of acres of limestone outcrops from central Texas through the Ozarks. Additional migration patterns were traced for *J. procera*, the only species that grows in the southern hemisphere from Arabia into east Africa. Infraspecific variation in *J. phoenicea* and its infraspecific taxa was based on leaf essential oils using DNA fingerprints, RAPD (random amplification of polymorphic DNA) markers. Geographic variation in *J. polycarpos*, monospermous junipers of the Chihuahuan desert, *J. thurifera*, and *J. virginiana* complete this section.

Keys to *Juniperus* species and varieties are arranged geographically into the Eastern Hemisphere, into Europe, Canary Islands, Azores, Asia Minor and Africa, into Central Asia, into China Himalayas, Mongolia, Russia, and Korea, into the Far East (Japan, Taiwan, Sakhalin Island), into Continental North America, into Canada and the United States of America, into Mexico and Guatemala, and into Caribbean Junipers. Obviously a species such as *J. communis* will appear in more than one key. These dichotomous keys are numbered, indented and based on paired couplets of usually one, two or three characters but are sometimes rather long descriptive statements. The leads are sometimes separated by several pages, extend up to 39 couplets, and are not reversible.

Species Descriptions, Distribution Maps and Photos are provided for all of the taxa included in the book. An added feature is the inclusion of the status of each taxon category, for example, critically endangered, endangered, and vulnerable among others. Each species description has the following categories in boldface: Dioecious/monoecious, Trunk bark, Branches, Leaves, Seed cones, Seeds, Pollen shed, Habitat, Uses, Dist., and Status. The majority of the book is devoted to this section from pages 101 to 327.

My comments on species descriptions will be confined to *J. virginiana* var. *virginiana* (Eastern Red Cedar although it is not a true cedar) as an example since I have collected fungi, corticolous myxomycetes and bark samples from this species for more than 45 years throughout the Southeastern and Midwestern U.S.A. Beauty is in the eye of the beholder, but this taxon has a special beauty highlighted by a conical or pyramidal shape, deep green leaves that remain evergreen, and the fleshy, bright, blue berrylike cones of the female trees. Cemeteries located throughout the central and southeastern United States of America often had *J. virginiana* var. *virginiana* trees, sometimes to the exclusion of other tree species. Apparently *J. virginiana* was planted near gravesites because it was readily available as a native tree species, it grew well in open field areas in full sun, and symbolically was considered the "death tree." The photographic black and white images do not do justice to the attractive plantings and landscapes of this taxon. One image in particular Figure 7.15 shows this taxon along a

fence row where birds have roosted and excreted "planted" seeds. I have seen this fence row growth pattern in a number of different places. While a graduate student at the University of Kansas in Snow Hall I observed hundreds of cedar wax wings birds congregating in a female Eastern Red Cedar tree apparently feeding on the fleshy cones. Another interesting use of Eastern Red Cedar is as a tree species in shelterbelts in Western Kansas. Many of these were planted in the 1930s during the dust bowl years. This is a hardy tree that tolerates cold and hot temperature extremes and provides wildlife habitat especially for pheasants, reduces wind velocity (windbreak) against soil erosion and loss of moisture from soil, provides shade for buildings nearby, and protects farm livestock and gardens from exposure to weather extremes. This should have been included as a major use of this tree species.

Juniperus virginiana var. *virginiana* is the primary host for the cedar-apple rust fungal pathogen, *Gymnosporangium juniperi-virginianae*. Many other species of *Juniperus* can also serve as the host of this destructive fungal pathogen that also have as an alternate host *Malus* (apple trees). The photographic image (page 324) shows the reddish-brown, hard, bodies about the size of a pecan attached to the Juniper twigs that are sometimes confused with insect galls. In April and May after prolonged rainy periods these galls swell in size and appear as a gelatinous, bright orange ball with long horns. Heavy infestations of the rust fungus result in trees decorated with balls that appear much like Christmas tree ornaments. The telial horns produce teliospores that germinate into basidiospores eventually transported by wind to apple trees several miles nearby. The growth of the fungus forms unsightly lesions on apple leaves and fruit that eventually can result in significant economic loss due to the decline in apple production. The removal or controlled planting of these trees is essential to break the disease cycle of this plant pathogen.

The chapter on Ecology emphasizes the occurrence of *Juniperus* species on limestone escarpments, sand dunes, sphagnum bogs and swamps, the margins of deserts, and invading the tall grass, deep, blackland soils in central Texas as for example *J. ashei*. Species of *Juniperus* in the Midwest are weedy and in prairie habitats aggressively invade open fields becoming a nuisance and cause for removal.

Seed dispersal in *Juniperus* is a chapter that highlights the role that birds play in feeding on the fleshy seed cones and serve as the main dispersal source over longer distances. Figure 8.1 is a graphic flow chart of agents, percentages, and distances of seed dispersal. Mammal species are also involved in seed dispersal and germination experiments show that intestinal passage significantly improves germination in most cases. Harvester ants also form marching columns to Juniper trees on a daily bases then carry back the female cones some distance to their underground ant nests.

Sexual expression in *Juniperus* is in the majority of species dioecious but a few trees that are predominately male trees produce a few female cones and the opposite is also true. *Juniperus osteosperma* is the exception with 85 to 90% of the trees monecious (both male and female cones on the same tree). The author's observations that environmental stress, such as xeric sites or trauma caused by a broken branch, may induce either male or female cones suggest external factors also play a role in maleness or femaleness.

The Commercial Use of Junipers is a must read chapter to fully appreciate how byproducts such as cedarwood oil and cedarwood is used. A table of heartwood oils with percentages of chemical components such as cuparene, decrol, and widdrol is recorded in different species of Junipers. There is a section on cedarwood oil extraction in Texas that shows truck loads of *J. ashei* transported to commercial extraction plants in the central Texas area and a discussion of extraction processes. Cedarwood chips are sold commercially and used around houses to repel insects. The insecticidal properties of cedar wood are active against a wide spectrum of insects including German cockroaches, moths, ants, and termites hence the use of Junipers that has a natural preservative for fence posts or lining cedar chests and closets where clothes are stored. Although not mentioned in the book cedarwood was used to make wooden pencils. Indeed a pencil factory was located at Cedar Key, Florida where a museum documents the extensive logging of cedar trees in combination with hurricanes that led to the decimation of the trees that once grew abundantly in the area.

This book is not without shortcomings but the content deserves special recognition as a scholarly publication worthy of the designation as a classical piece of scientific literature. Travel to faraway places throughout the world to collect specimens, use of the modern techniques of DNA analysis, use of terpene and essential oil chemistry, and the traditional use of morphological characters and the type method add to the scientific value of the narrative. Persons interested in conifers will appreciate the most up to date authoritative reference on Junipers. College, university, and public libraries will want to have this affordable book available to the general public to enjoy the biodiversity of Junipers. This book should be purchased because of the bargain basement price and information useful to botanists and botanical gardens, foresters, herbaria, landscape nurseries, museums, nature and state conservation agencies, rangeland and wildlife managers, and state and national parks.

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Steven H.D. Haddock and Casey W. Dunn. 2011. **Practical Computing for Biologists.** (ISBN: 978-0-87893-391-4, pbk.). Sinauer Associates, Inc., Publishers, 23 Plumtree Road P.O. Box 407 Sunderland, MA 01375-0407 U.S.A. (**Orders:** www.sinauer.com, 413-549-4300). $50.96, 538 pp., 65 illustrations, 7.5" × 10".

This is a very well done work that details various computer programming and bioinformatics concepts. While this may not be the best choice for a casual read, it is a great supplement to the knowledge of experienced programmers. *Practical Computing for Biologists* goes beyond basic introductory level concepts and focuses on such topics as reformatting data, creating graphics, and working with large data sets. Steve Haddock and Casey Dunn thoroughly explain how to confront difficult computing tasks with greater efficiency.

The book begins by answering some basic and predictable questions: how to use this book, how it pertains to biology, as well as indicating which programming language and operating system it will be predominantly using. After the first introductory chapter, the book builds upon previous chapters' concepts at a rapid pace. Each chapter requires access to your computer in order to implement the information learned. As mentioned before, this is not an easy read for the inexperienced layman, so at times certain topics can seem daunting and esoteric. But there are multiple examples scattered throughout this guide as well as resources found in the back appendices that help convey the information. Overall this a well written book that can benefit aspiring bioinformatics or computer programming students by expounding upon previously learned subjects in a efficient and straightforward manner.

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